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VIEWPOINTS AND SELF-EFFICACY OF TEACHERS PARTICIPATED IN PROJECT TRAINING TOWARDS PROJECT-BASED LEARNING

Research Article

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Abstract

This research focuses on how teachers' self-efficacy changes as a result of a project consultancy training and their views on project-based learning. The study group of the research consists of 47 teachers working in Ministry of National Education who participated in "2237 coded Project Consultancy Trainer Training" program organized in 2019 in cooperation with The Scientific and Technological Research Council of Turkey (TUBITAK) and Ministry of Education. In this research, mixed method was used in which qualitative and quantitative data were used together. In the quantitative stage of the research a semi-experimental design without a control group; in the qualitative stage, a case study was adopted. As the data collection tool, "Self-efficacy scale related to project based teaching" developed by Mutlu and Yildiz Fidan (2018) and "Teacher view form related to project based teaching" developed by the researchers were used. As a result of the study, it was concluded that there was a statistically significant increase between the pre-test and post-test scores. In addition, it was determined that there was no significant difference according to the variables of gender, branch and making project status. From the teachers' views on project-based teaching, the most difficult stage of the project was "finding a project subject"; and it was understood that "writing reports" was the stage that they thought they could easily do while they were doing the project. However, it was found that the views of teachers such as "my deficiencies were completed" and "my self-confidence / motivation increased" were formed as a result of the training.

Keywords: Project management, project based learning, self-efficacy, science teachers

1. Introduction

It is very difficult to train individuals, especially with 21st century skills in the global citizens profile with traditional teaching methods. However, rapidly developing technology, the emergence of new professions, changing world demands and so on caused the methods that centered the students in the schools to come to the fore. Project-based teaching is one of the methods that are student-centered.

Project-based teaching is a systematic learning model that builds learning through projects (Thomas, 2010). The projects also allow the use of alternative approaches to students' individual differences, different learning styles, intelligence, abilities or disabilities (Saracaloğlu, Özyılmaz Akamca and Yeşildere, 2006). Good planning is necessary to make a successful project. Unlike traditional methods, both teachers and students are involved in the planning process. Project-based teaching is a tool through which students can connect with real-world work (Bell, 2010). In parallel, it can be said that student learning is unique and

valuable due to the fact that it is connected to real life and access to information through its own efforts (Saracaloğlu, Özyılmaz Akamca and Yeşildere, 2006).

Project based teaching approach is a learning approach that aims to solve problems with an approach similar to life under natural conditions through individual or small groups. This approach, inspired by the educational principles put forward by John Dewey, not only gives importance to individual learning but also provides a relationship between school and life (Korkmaz and Kaplan, 2001). With project-based learning, students develop effective solutions as well as meta-cognitive skills (Blumenfeld, Soloway, Marx, Krajcik, Guzdial, and Palincsar, 1991). Project-based learning, which provides students with an equal learning environment, also positively contributes to their academic achievement (Solomon, 2003).

Project-based learning is a learning approach that requires process-oriented and classroom interactive environments. These learning environments are technology-based learning environments where students construct and direct their own learning and therefore develop their creativity, try to solve the problems they face in cooperation, make decisions about their success, move life into the classroom, and actively participate in the learning process (Erdem, 2002). Modern digital technology is a great opportunity for students to design and develop their projects since they can document the whole process and easily share what they have done in the digital environment (Patton, 2012).

According to Grossman, Pupik Dean, Kavanagh, and Herrmann (2019), for an effective project-based teaching approach in classrooms, teachers motivate and discipline students as their main task and they create an iterative culture while supporting collaboration. The basics of project-based teaching practices focus on four main objectives (Figure 1).

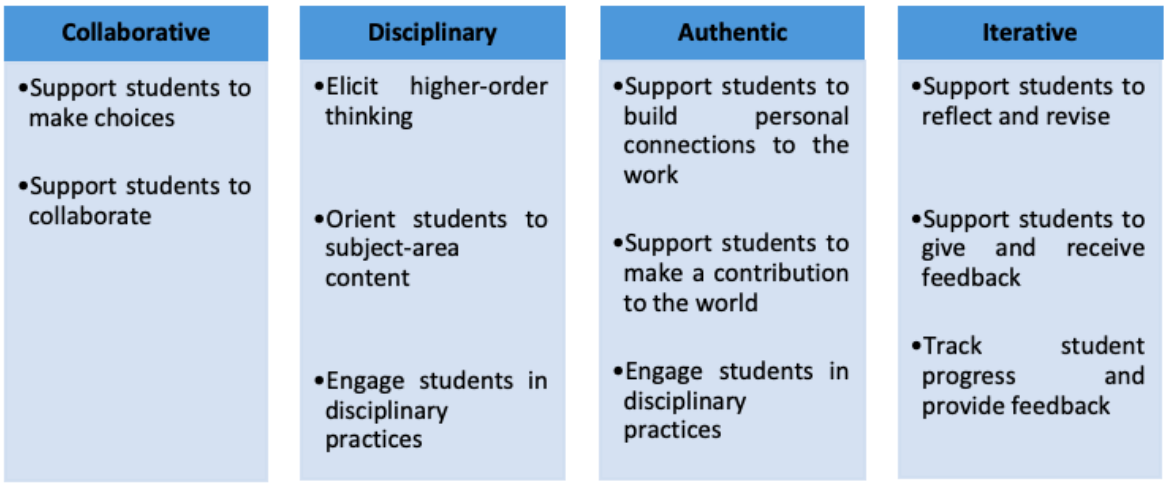

Figure 1. The core practices of project based teaching (Grossman, Pupik Dean, Kavanagh and Herrmann, 2019)

In the implementation of project-based teaching, the guidance role of teachers in particular is very important. However, it is very difficult for a teacher to achieve this without sufficient experience. In addition to theoretical training, teachers also need practical experience on this method (Wu and Meng 2010). During the implementation of project-based teaching, the teacher needs to be clear about what the project is about, selective and careful in determining the study group. It is important that teachers recognize students' interests and abilities, offer

them options and encourage their students to conduct scientific research (Saracaloğlu, Özyılmaz Akamca and Yeşildere, 2006).

Self-efficacy beliefs of teachers on project-based teaching for good practices are very important. Bandura (1994) defines self-efficacy as beliefs about the capacity of people to produce levels of performance that are effective on events affecting their lives. Self-efficacy beliefs determine people's feelings, thoughts, behaviors and how they motivate themselves. Teachers' self-efficacy beliefs are shaped according to the practices and planning in the course (Pajares, 1992). In this context, self-efficacy belief in PBL practice can be defined as "individual's self-judgment in proper use of PBL" or" individual's belief in PBL practice ". Self-efficacy levels and perceptions of teachers about PBL approach both important in the teaching of the courses according to their aims, and in addition to providing the students with logical thinking skills, overcoming the difficulties encountered in the application of innovative educational technologies and raising the successful individuals (Nacaroğlu & Mutlu, 2018).

There are not enough experimental studies related to teachers' own experiences and perspectives in their transition from teaching programs to working environments (Allen & Wright, 2014). Further research is needed to explore teachers' views on the advantages and challenges of project-based teaching in order to increase the use of project-based teaching (Aksela and Haatainen, 2018). It has been observed that more studies have been carried out on students because the method is student-centered. On the contrary, it is very important to determine how adequately the teachers perceive themselves about the project-based teaching method, which factors affect their perceptions, which stages they can make easier and when they use this method. However, when the literature is examined, it is understood that the studies are mostly on teachers in certain fields (Asilsoy, 2007; Kaymakçı and Öztürk, 2011; Şahin, 2012; Aydın and Yel, 2013; Ülker Kurtuluş, 2019). In this study, the education of teachers from different science and mathematics areas is also important in terms of facilitating the cooperation between teachers in making interdisciplinary projects.

In this study, it is aimed to determine how self-efficacy of project-based teaching changes as a result of the project consultancy training of physics, chemistry, biology and mathematics teachers. For the aim of the study, the answers to the following questions were sought depending on the problem statement "Is there any difference in the self-efficacy perceptions of physics, chemistry, biology and mathematics teachers about project-based teaching before and after the application?":

1- Is there a significant difference between the pre-test and post-test scores of the teachers' self-efficacy scale regarding project-based teaching?

2- Do teachers' self-efficacy scale achievement (posttest-pre-test) scores differ by gender?

3- Do teachers' self-efficacy scale achievement scores for project-based teaching show a significant difference according to the branch?

4- Do teachers' self-efficacy scale achievement scores for project-based teaching show a significant difference according to the project-making status?

5- What are the views of teachers on project-based teaching?.

2. Methodology

2.1 Research design

In this study, mixed methods was used in which qualitative and quantitative data were collected together. Explanatory sequential design was determined from mixed methods

research (Creswell and Plano-Clark, 2015). In the descriptive sequential pattern, first quantitative data is collected and evaluated. Then, qualitative data are used to elaborate and explain quantitative data (Creswell, 2013).

In the quantitative stage of the study, in accordance with the mixed method approach, pre-test and post-test control group semi-experimental design (including pre-test and post-test without control group) was used. The quasi-experimental design is preferred when the controls required by the actual experimental model can not be provided or are not sufficient (Karasar, 2012, p.99). In this study, this model was chosen because all teachers participating in the project were involved in the activities and there was no equivalent control group to which the participant group could be compared.

In the qualitative phase of the research, case study was used. Case studies are a preferred strategy in situations where the focus is a current fact related to real life and the researcher has little influence on events (Yin, 2009).

2.2 Study group

Criterion sampling which is one of the purposeful sampling methods was used in the research. In this sampling, the criterion or criteria can be created by the researcher or a previously prepared criterion list can be used (Yıldırım & Şimşek, 2013). The study group of this study consists of teachers working in Ministry of National Education who participated in "2237 coded Project Consultancy Trainer Training" program organized by TUBITAK-MNE in Yalova in March 2019. Teachers have been included in the program in order of ranking among those who have achieved at least one of the selection criteria "To have completed a master's degree / To have participated in a project training / To have done a project before".

As a result of the fact that some of the teachers could not participate in the pre-test and some of them could not participate in the post-test, the study was conducted according to the data of a total number of 47 teachers. In addition, all teachers from whom quantitative data were obtained were used to obtain qualitative data. Demographic information of the study group of the study is presented in Table 1.

Table 1. *Demographic information about the participants*

Demographic characteristics		**N**	**%**
Gender	Female	24	51
	Male	23	49
Education status	Graduate	12	25
	Postgraduate	35	75
Branch	Physics	11	23
	Chemistry	9	19
	Biology	14	30
	Mathematics	13	28
Professional experience	0-10 years	11	24
	11-20 years	18	38
	21 years and above	18	38
Did you make a Project before?	Yes	32	68
	No	15	32
TOTAL		**47**	**100**

2.3 Content of project consultancy training of trainer

"Project Consultancy Training of Trainer" for teachers includes an education process for 30 days (45 minutes) of four days (Appendix 1). These trainings were given by four lecturers who are experienced in project consultancy trainings from different universities. The program consists of two main stages: theoretical and practical. First stage; information was given by the faculty members on the main topics such as the nature of science, project management, statistics, access to information on the internet, ethics of scientific research and reporting of research results. The content is given with power-point presentation and supported by sharing the experiences of the teachers with question-answer, case studies and basic practices. In addition, the participant teachers shared their problems and facilities. In the second stage, the teachers were divided into classes according to their fields and experienced with the process of finding project subject, writing project proposal and preparing project presentations with groups of 3-4 people. At this stage, mentors from physics, chemistry and biology have guided teachers. Finally, by presenting the project proposals prepared, an environment was prepared where questions and answers and views and suggestions of the participants were shared.

2.4 Data collection tools

"Self-efficacy scale related to project-based teaching" developed by Mutlu and Yıldız Fidan (2018) and "Teacher view form for project-based teaching" developed by researchers were used as data collection tools. The self-efficacy scale related to the project-based teaching used for the quantitative stage of the research consists of five sub-dimensions and 24 items and the Cronbach α coefficient was given as 0.92. The Cronbach α coefficient calculated for this study is 0.95. In the positive items of the five-point Likert scale, the " strongly agree "option was 5 points and the option "strongly disagree" is 1 point. In the negative items of the scale, the opposite was scored. The lowest score that can be obtained from the scale is 24 and the highest score is 120.

At the qualitative stage, teachers' views on project-based teaching were collected through a form developed by the researchers. In the preparation of the draft questions of the qualitative assessment tool, literature review and quantitative assessment tool were taken into consideration. The questions were examined by the field experts and the form was finalized with three open ended questions.

2.5 Data Analysis

SPSS 22 statistical package program was used for the analysis of the obtained quantitative data. In order to decide which statistical tests will be used in the analysis of the quantitative data, it was examined whether the data was distributed normally. One of the methods used in the assumption of normality is to calculate the skewness and kurtosis of the distribution. According to the pre-test data skewness is -.302, and kurtosis is -.191; skewness of posttest data was -.571, and kurtosis was -.037. Parametric analyzes are performed when skewness and kurtosis are within ± 1.5 (Tabachnick and Fidell, 2013). One-way analysis of variance (ANOVA), t-test for unrelated samples and t-test for dependent samples were used for data analysis. Levene test was used to check the homogeneity of variances. In order to determine the source of the differences, Tukey test was used in the groups that provided the homogeneity of the variances and Tamhane test was used in the groups that did not meet the homogeneity of the variances. In addition, frequency, percentage, average and standard deviation values were calculated from the basic statistics. The results obtained from the data were evaluated according to the significance level of * $p < .05$. Content analysis was used in the analysis of qualitative data. In content analysis, the main process is to interpret similar data by gathering them under certain concepts and themes (Yildirim & Simsek, 2013).

Reliability of qualitative data analysis; Consensus / (Consensus + Disagreement) x 100 was calculated using the formula (Miles and Huberman, 1994). The reliability between coders was calculated as 89%.

3. Results

This section includes the results of teachers' self-efficacy perceptions and views about project-based teaching obtained as a result of analyzes conducted in line with the sub-problems of the research.

In the research, the t test results of the question "Is there a significant difference between the pre-test and post-test scores of the teachers' self-efficacy scale related to project-based teaching? "is given in Table 2.

Table 2. *The t-test results of pre-test and post-test mean scores of teachers' self-efficacy scale related to project-based teaching*

Scale		N	$\overline{X}$	SS	Sd	T	p
Mastering and guiding the project process	Pre-test	47	37.81	5.848	46	-3.795	.000*
	Post-test	47	41.09	4.015			
Planning, preparation and reflection	Pre-test	47	15.87	2.700	46	-3.699	.001*
	Post-test	47	17.62	2.327			
Application and evaluation	Pre-test	47	17.62	4.372	46	-3.158	.003*
	Post-test	47	20.04	4.075			
Feedback, alternative evaluation	Pre-test	47	11.89	1.970	46	-2.500	.016*
	Post-test	47	12.81	1.884			
Group process and level learning	Pre-test	47	11.98	1.726	46	-5.942	.000*
	Post-test	47	13.51	1.487			
Self-efficacy on project-based teaching	Pre-test	47	95.17	13.453	46	-5.064	.000*
	Post-test	47	105.06	10.443			

It is seen that there is a statistically significant increase between the pre-test and post-test scores of the self-efficacy scale and sub-dimensions of the project-based teaching of the teachers who participated in the project consultancy training ($t(46) = -5.064$; $p < .05$).

Independent t-test results obtained from the question "Do the teachers' self-efficacy scale achievement scores of the project-based teaching show significant differences according to gender?" are presented in Table 3.

Table 3. *T-test results of teachers' self-efficacy scale achievement scores according to gender variable*

Scale	Gender	N	$\overline{X}$	SS	Sd	t	p
Mastering and guiding the project process	Female	24	3.54	5.680	45	.311	.758
	Male	23	3.00	6.274			
Planning, preparation and reflection	Female	24	2.04	2.851	45	.639	.526
	Male	23	1.43	3.628			
Application and evaluation	Female	24	3.33	3.886	45	1.202	.237
	Male	23	1.48	6.352			
Feedback, alternative evaluation	Female	24	.79	2.021	45	-.341	.735
	Male	23	1.04	2.977			
Group process and level learning	Female	24	1.92	1.412	45	1.536	.133
	Male	23	1.13	2.029			
Self-efficacy on project based teaching	Female	24	11.63	11.631	45	.903	.371
	Male	23	8.09	15.066			

It was found that there was no significant difference between the achievement scores of teachers (self-efficacy scale) (t (45) = .903; p> .05) and the sub-dimensions of the scale according to gender variable.

The results of the one-way analysis of variance obtained from the question "Do the teachers' self-efficacy scale achievement scores of the project-based teaching show a significant difference according to the branch?" are given in Tables 4 and 5.

Table 4. *Descriptive statistics of teachers' self-efficacy related to project-based teaching according to branch variable*

Scale	***Branch***	***N***	$\overline{X}$	***SS***
Mastering and guiding the project process	Physics	11	3,27	5,815
	Chemistry	9	2,89	8,418
	Biology	14	4,21	4,300
	Mathematics	13	2,54	6,091
Planning, preparation and reflection	Physics	11	1,18	2,639
	Chemistry	9	,56	3,812
	Biology	14	2,43	2,901
	Mathematics	13	2,31	3,637
Application and evaluation	Physics	11	3,45	7,475
	Chemistry	9	-1,00	4,848
	Biology	14	2,93	3,125
	Mathematics	13	3,38	4,735
Feedback, alternative evaluation	Physics	11	1,45	1,695
	Chemistry	9	1,56	3,087
	Biology	14	,07	2,645
	Mathematics	13	,92	2,532
Group process and level learning	Physics	11	1,55	1,508
	Chemistry	9	1,00	2,236
	Biology	14	2,36	1,151
	Mathematics	13	1,00	2,000
Self-efficacy on project based teaching	Physics	11	10,91	11,131
	Chemistry	9	5,00	17,464
	Biology	14	12,00	10,258
	Mathematics	13	10,15	15,588

Table 5. *ANOVA results of teachers' self-efficacy related to project-based teaching according to branch variable*

Scale	Source of variance	Sum of squares	Sd	Mean square	F	p
Mastering and guiding the project process	Between groups	20,746	3	6,915	,187	,905
	Within groups	1590,659	43	36,992		
	Total	1611,404	46			
Planning, preparation and reflection	Between groups	26,880	3	8,960	,849	,475
	Within groups	454,056	43	10,559		
	Total	480,936	46			
Application and evaluation	Between groups	132,757	3	44,252	1,665	,189
	Within groups	1142,733	43	26,575		
	Total	1275,489	46			
Feedback, alternative evaluation	Between groups	16,858	3	5,619	,886	,456
	Within groups	272,801	43	6,344		
	Total	289,660	46			
Group process and level learning	Between groups	15,761	3	5,254	1,766	,168
	Within groups	127,942	43	2,975		
	Total	143,702	46			
Self-efficacy on project based teaching	Between groups	289,867	3	96,622	,522	,670
	Within groups	7962,601	43	185,177		
	Total	8252,468	46			

It was found that there was no significant difference in the scores of teachers from the self-efficacy scale (F (3,43) =. 522; p> .05) and the sub-dimensions of the scale according to the branch variable (Table 4, 5).

In the research, the independent t test results obtained from the question “Do the teachers' self-efficacy scale achievement scores of the project-based teaching show a significant difference according to the project status?” are presented in Table 6.

Table 6. *T test results of teachers' self-efficacy scale achievement scores according to project variable*

Scale	**Making project status**	**N**	$\overline{X}$	**SS**	**Sd**	**T**	**p**
Mastering and guiding the project process	Yes	32	3.19	4.895	45	-.149	.882
	No	15	3.47	7.873			
Planning, preparation and reflection	Yes	32	1.53	2.851	45	-.657	.515
	No	15	2.20	4.004			
Application and evaluation	Yes	32	2.53	5.685	45	.199	.843
	No	15	2.20	4.411			
Feedback, alternative evaluation	Yes	32	1.03	2.546	45	.460	.648
	No	15	.67	2.498			
Group process and level learning	Yes	32	1.69	1.512	45	.764	.453
	No	15	1.20	2.242			
Self-efficacy on project-based teaching	Yes	32	9.97	11.206	45	.056	.956
	No	15	9.73	17.645			

It was found that there was no significant difference in the achievement scores (t (45) =. 056; p> .05) and sub-dimensions of the scale which were obtained from the self-efficacy scale related to project-based teaching.

Teachers' views about the qualitative sub-problem of the research were coded by content analysis. For this purpose, three questions were asked to the teachers. The themes and codes of the teachers' answers were given with frequency and percentage values and also supported by sample teacher statements.

The first question asked in the qualitative aspect of the research is "What are the stages / stages that you think will push you the most when you make a project? Please explain the reasons". Table 7 presents the results of the content analysis of the most difficult stages of teachers' projects.

Table 7. *Content analysis results obtained from the teachers' views about the most difficult stages of the project*

Theme	**Codes**	**f**	**%**
Most difficulty stages of the project	Finding a project topic	25	27
	Finding project students	13	14
	Literature review	12	13
	Lack of infrastructure / budget	11	12
	Setting up experimental studies	10	11
	Using statistical metrics	7	7.5
	Lack of support from universities / administrators	7	7.5
	Time management	5	5
	Writing a project report	3	3

According to the codes obtained from the teachers' views about the most difficult stages of the project, finding the subject of the project was determined as the most challenging stage (f = 25, 27%). In addition, it was found that "writing a project report sahip had the least frequency among the most difficult stages of teachers (f = 3, 3%). Below are some of the statements that teachers use about the most difficult stages of the project.

T30: Determining the subject will be the most difficult step because it may be difficult to decide that the subject is suitable for the study and to produce a product that will contribute to the literature in the face of a vast literature (Finding a project subject).

T14: There are problems about being original and researchable during the determination of the subject (Finding the subject of the project).

T47: It is very difficult to find project students because it cannot allocate time-interest to project studies with the intensive curriculum (Finding project students).

T25: I think that literature search is a very comprehensive, time-consuming process that needs to be meticulous (Literature search).

P44: I do not have sufficient foreign language level and I find it very difficult to scan articles (Literature search).

T11: It is difficult and expensive to find and we have problems when we need an advanced laboratory (Lack of infrastructure / budget).

T46: My main problem is that we cannot carry out a laboratory-supported study because the school laboratory conditions are insufficient since we live in the district (Lack of infrastructure / budget).

T33: I think I am inadequate to conduct experiments. In the first place, I may not know how to separate the desired component from a substance and what methods I will use to analyze the properties of that component (setting up experimental studies).

T10: The experimental phase is the part that I think I will have the most difficulty. The reason is that I don't have enough experience on this subject (setting up experimental studies).

T36: Inability to use SPSS program in statistical measurements (Using statistical measurements).

T6: Difficulties experienced by the managers with little support for such issues (Lack of support from universities / administrators).

T37: Time management (Time management), as the time frame we can meet with the student is very limited.

T16: Unfortunately, time management and effective use of time are the things that affect me the most. Because, on the one hand, the teaching of biology curriculum, on the other hand, conducting procedural work in the school, limits me in terms of time to produce the work that I really want to do in the remaining time (Time management).

T39: Difficulty in reporting stages of project writing (Project report writing).

When the expressions that teachers stated were the most difficult stages during the project, it was found that teachers decided based on their individual experiences. In particular, they see the current field knowledge, setting up and conducting experiments, knowledge of foreign languages, mastery of statistical measurements and so on. According to the shortcomings, it is understood that they have difficulties in the stages of project design.
The second question asked in the qualitative aspect of the research is "*What are the stages / stages that you can easily / do you think you will do? Please explain the reasons.*" Table 8 shows the content analysis results obtained from the stages that teachers think they will easily do while they are doing the project.

Table 8. Content analysis results obtained from the views of teachers about the stages that they think they can easily do while project

Theme	**Codes**	**F**	**%**
Not difficult stages perceived by teachers	Writing a project report	16	21
	Literature review	11	14
	Finding a project topic	10	13
	All phases of the project	10	13
	Student selection and motivation	8	10
	All stages except subject	6	8
	Determining the method	6	8
	Time management	5	6.5
	Analysis and interpretation of data	5	6.5

When the codes obtained from the views of teachers regarding the stages they thought they would do easily, "writing a project report" took the first place (f = 16, 21%); "Time management" and "analysis and interpretation of data"appear to be the last (f = 5, 6.5%). Below are some of the expressions that teachers use for the stages that they think they can easily do when they make projects.

T24: Writing a report according to the project steps (Writing a project report).

T41: I do not think that there will be any difficulty in writing (Project report writing) after necessary studies and findings are reached.

T6: I have no difficulty in literature review. Because I continue to connect with the university and I do not attend the congresses related to my branch very often (Literature search).

T31: Finding original topics (Finding a project topic).

T29: With the information we have seen during this training process, I think that I will be able to fulfill all stages of the project (all phases of the project).

T33: I can convince the student more easily about making a project (Student selection and motivation).

T46: After finding the idea, I have no problems in terms of purpose, hypothesis, method and application (all stages except the subject).

T18: I think that I can easily do after the project is selected (all stages except the topic).

T22: The method part of the project can be done easily. Because I will be competent in the determination of the subject, introduction and other parts, the method will remain to be applied.

T1: Business timetable (Time management).

T5: I am good at analyzing, evaluating and interpreting the data obtained since it is good and practical in the measurement step (Data analysis and interpretation).

When the teacher sample expressions given above are examined, it is understood that teachers determine the stages that they think they can easily do according to their own infrastructure. However, the most striking feature is that some codes such as "finding a project subject" and "time management", which were found to be difficult in the previous question, are reused as the easiest step in this question. At this point, depending on the individual differences of teachers, a difficult stage for some may be an easy stage for others. When the source of these individual differences is examined, it is found that they have done master, doctorate and / or many projects (between 3-15) as the main factor.

The last question asked about the qualitative aspect of the research was "How did this training change your views on project preparation? Explain." Table 9 shows the results of content analysis on the effects of teachers' training on their ideas about project preparation.

Table 9. Results of content analysis on how teachers' views about project preparation changed with the training they participated

Theme	Codes	F	%
Effects of project training	I completed my deficiencies	25	33
	Increased self-confidence / motivation	17	22
	I realized it wasn't hard to do a project	9	12
	I noticed the importance of topic selection	7	9
	I can be a better guide	6	8
	I can easily edit statistical data	5	7
	I have learned how a quality project should be	4	5
	I can write report more easily	3	4

According to the codes related to the views of the teachers which changed as a result of the project consultancy training of trainers, the most common code was “I completed my deficiencies” (f = 25, 33%). It was found that the code “I can write the report more easily” was used the least (f = 3, 4%). Here are some examples of how teachers participating in project consultancy trainers express their changing views.

T21: It caused me to complete my missing information about the project preparation steps (My deficiencies are completed).

T35: I had past knowledge, but I thought that my knowledge was insufficient in many parts. With the training I received, I realized that the fog in my head was dispersed and that I saw more clearly in front of me (My deficiencies were completed).

T17: It was not difficult to create projects, so it increased our self-confidence (My self-confidence / motivation increased).

T5: He reminded me that I am only news about the paradigms that consist of the current understanding of science and that I deprive myself of scientific literacy through field monitoring. From now on I will have to review my learning needs (My self-confidence / motivation has increased).

T30: It seemed utopian to me to prepare a project, where and how to start was a question mark in my mind. But now my horizons widened, and I realized that many of the issues that I have enlarged in my eyes will actually be overcome by starting (I understand that it is not difficult to make a project).

T18: I understood better that authenticity is important in the project (I realized the importance of choosing a topic).

T7: I can provide more efficient and effective guidance to my students (I can be a better guide).

T10: My skills in measurement and evaluation have increased (I can edit statistical data more easily).

T46: I had some hesitations about some spelling steps. I found that the questions and problems I had with my friends and teachers were resolved (I can write the report more easily).

T22: I have seen seriously different aspects of project preparation. In this context, I have seen that both the teacher and the student will develop themselves seriously and open up different perspectives to the student (I can write the report more easily).

When the views of the teachers participating in the project consultancy training of trainers are examined, it is understood that they have completed their deficiencies in terms of information, their participation in stakeholder applications and their willingness to make projects. It is especially noteworthy that teachers have changed their negative viewpoints about project preparation in a positive way.

4. Discussion and conclusion

In this study, it was concluded that there was a statistically significant increase between the pre-test and post-test scores of the self-efficacy scale and sub-dimensions of the teachers who participated in the project consultancy training. Sağdıç, Çelik and Karamustafaoğlu (2017) examined the effect of academic counseling and qualitative research program on the ability of young researchers who continue their graduate education to prepare project proposals. It was determined that the competence of the participants in qualitative research

and writing scientific research proposal increased from medium level to good level. Önen, Mertoğlu, Saka, Gürdal (2010), it was revealed that a significant part of the teachers participating in the "Project for teacher training project" gained the competence to make projects as a result of the examination of the projects they prepared during in-service training. Aydın and Yel (2013) found that the course of project-based teaching increased the pre-service teachers' biology self-efficacy beliefs but this did not differ according to gender variable. Mahasneh and Alwan (2018) found that there was a significant difference in teacher self-efficacy levels as a result of project-based training based on teacher candidates. Nacaroğlu and Mutlu (2018) conducted a study in order to determine the self-efficacy of teachers based in a science and art center in order to determine the self-efficacy of the project-based teaching practices. These results support the findings of the increase in the self-efficacy of the teachers of this research for project-based teaching.

In the study, it was concluded that there was no significant difference in the scores of teachers' self-efficacy scale related to project-based teaching (posttest-pretest) scores and sub-dimensions of the scale according to the variables of gender, branch and project status. In parallel with these findings, according to the study of Nacaroğlu and Mutlu (2018), it was found that teachers' self-efficacy beliefs related to PBL application did not show significant differences in terms of gender. Aydın and Yel (2013) determined that the increasing biology self-efficacy beliefs of teacher trainees did not differ according to gender variable in the courses related to project-based teaching. Similarly, in the study conducted by Özden, Aydın, Erdem and Ekmekçi (2009), no significant difference was found in the views of science teachers regarding project-based science teaching according to their gender. In addition, Akbaş and Aydın (2019) found that pre-service teachers who are experienced or not have similar project perceptions. These results are similar to the findings of this study. The fact that teachers' self-efficacy belief levels do not differ according to the status of doing PBL can be explained by the fact that they have done master and doctorate.

According to the codes obtained from the teachers' views about the most difficult stages of the project, "finding the topic of the project, finding students, literature review, lack of infrastructure / budget, setting up experimental studies, using statistical measurements, lack of support from universities / administrators, time management, writing reports" were the most difficult stages. Similarly, Ülker Kurtuluş (2019) found that teachers had difficulty in literature review, statistical analysis and interpretation, finding a unique topic and cooperating with academicians due to lack of foreign language and lack of access to university databases. Asilsoy (2007) stated that teachers' concerns about project-based teaching are such as the fact that biology course has very little weekly hours, curriculum is intense, university exam preparation is in the foreground, school administration is not supported and the number of students is high. Dağ and Durdu (2012), in their study with 364 prospective teachers from different branches, found that there were problems in project-based learning process, task sharing and time management in group works. According to the results of Özden, Aydın, Erdem and Ekmekçi (2009), some of the teachers believe that the project may require a great amount of financial resources, that it will take a long time to complete the project, it will be difficult to find the subject of the project, and that the project is difficult to manage and execute. Similarly, negative views of teachers were identified as the lack of time, material and financial problems in the studies of Sülün, Ekiz and Sülün (2009) on project-based teaching.

Şahin (2012), who worked with science and technology teachers to determine the level of difficulty encountered in the implementation of the project-based learning approach, found a medium level difficulty. In their study, Kılıç and Özel (2015) found that teachers did not find the project-based learning method applicable due to problems such as crowded classrooms

and very intensive curriculum in schools. In parallel, as a result of the research conducted by Aydın, Bacanak and Çepni (2013), although science and technology teachers did various projects, they did not receive adequate training on this subject and they did not receive sufficient guidance and prepared projects, receiving feedback and project examples. In the study conducted by Çakan (2005), it was seen that there was a curriculum that teachers should train and the exams they had to do according to this program and that the schools were inadequate in terms of tools and equipment. Likewise, according to the findings obtained by Kaymakcı and Öztürk (2011); in the social studies education, it was concluded that the project studies could not be implemented properly due to the problems caused by the environmental conditions, the projects provided the most benefit in providing research skills, and the project subjects were mostly selected from the current events. Tsybulsky and Muchnik-Rozanov (2019) found that in their study with prospective teachers using the project-based learning method, candidates had difficulty in controlling students, managing time and feeling confident. It is seen as a turning point that prospective teachers overcome the difficulties encountered in the project-based teaching process in becoming more confident and responsible teachers.

When the codes obtained from the views of teachers regarding the stages that they thought they would do easily during the project were examined, it was concluded that "report writing, literature review, finding subject, all phases of the project, student selection and motivation, method determination, time management, data analysis and interpretation" were obtained. Similarly, in the study of Aksela and Haatainen (2018), according to the teachers evaluating the project-based learning approach; they found that students and teachers had improved motivation, cooperation and community perception, student-centered learning, and multidimensional perspective. In addition, teachers' time management, student-related problems, technical issues, resources, etc. It is determined that they have the view that they face difficulties. Dağ and Durdu (2012), on the other hand, in a study conducted with 364 prospective teachers from different branches, showed that during the project-based learning process, prospective teachers developed their skills to analyze and synthesize the resources and information they gathered within the scope of the project in a highly positive way. These results support the research findings.

In this research, according to the codes related to the views of the teachers, which changed as a result of the project consultancy training of trainers, "my deficiencies were completed, my self-confidence increased, I realized that it was not difficult to make a project, I realized the importance of choosing a topic" were obtained. In their study, Öztuna Kaplan and Diker Coşkun (2012) prepared and implemented an action plan for teachers to carry out the project work in a healthy way. As a result of the study, it was concluded that teachers were more successful in overcoming the problems experienced in managing the related process, teachers and parents were more effective in the guidance process on the students and the projects developed were more satisfactory both for the students and the teachers. Likewise, Habók and Nagy (2016), as a result of their work to determine teachers' views on project-based learning, teachers themselves reported motivating students, transmitting of moral values and development of stress-free atmosphere. Önen, Mertoğlu, Saka, Gürdal (2010) found that in their research on the teachers participating in the "Project for teacher training project", there was a positive increase in the knowledge of the teachers on the current issues and their misconceptions about project-based learning were eliminated. Asilsoy (2007) developed a short-term in-service training (HIE) course program aimed at gaining the professional knowledge and skills required for biology teachers to use the project-based learning approach in their courses, and applied its effectiveness. From the data obtained, it was understood that the applied HIE course was effective in increasing the knowledge, skills and perspectives of

the participant biology teachers about the project based learning approach (PBL). At the end of the course, it was found out that the participant teachers believed in the importance of PBL and were willing to use this approach in their courses. Karakaya, Uzel, Yılmaz and Gül (2019) stated that biology teacher candidates contributed to project-based learning by doing-living learning, multi-faceted thinking and development of problem solving skills.

5. Recommendations

The recommendations based on the results of the research are presented below.

- It is important to increase the opportunities for both the completion of the deficiencies and the experience with the project development trainings that the teachers will attend at regular intervals.

- Monitoring the teachers participating in the project development training, finding the subject of the projects developed, planning and time management, determination of research method, analysis and evaluation and so on. It is necessary to determine the teacher self-efficacy in the stages of updating the programs of the new in-service trainings.

- Postgraduate training of teachers will increase their self-efficacy in project-based teaching since they will improve their scientific process skills. Therefore, more support should be provided for teachers to carry out graduate education.

- It was found out that teachers' level of knowledge of foreign language had difficulty in literature review from the stages of project development. For this reason, it is important that teachers acquire foreign language skills in their undergraduate education.

- It may be beneficial for teachers from different disciplines to have cooperative educational experiences to support cooperative working culture in interdisciplinary studies.

- The development of scientific process skills can be supported by ensuring that teachers are involved in the scientific research carried out in universities, technocities and research institutions at certain times.

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Appendix 1

PROJECT CONSULTANCY TRAINER TRAINING PROGRAM				
Course Hours	**1st Day 10.03.2019**	**2nd Day 11.03.2019**	**3rd Day 12.03.2019**	**4th Day 13.03.2019**
9.00 – 10.30	**OPENING, PRESENTATIONS, PRETEST**	**Nature of Science**	**Project Subject Research I Advisors in Biology, Physics, Chemistry and Mathematics**	**Preparation of Project Presentations I Advisors in Biology, Physics, Chemistry and Mathematics**
Course hour: 2 (Block)		*The nature of science and its effects on scientific studies will be explained.*	*Project studies will be carried out.*	*Preparation of Powerpoint Presentations*
10.45 – 12.15	**Project Management**	**Statistics I**	**Project Subject Research II Advisors in Biology, Physics, Chemistry and Mathematics**	**Preparation of Project Presentations II Advisors in Biology, Physics, Chemistry and Mathematics**
Course hour: 2 (Block)	*Project types, project subject determination, project team building, project management time, cost, procurement and risk factors will be discussed.*	*Basic concepts in statistics and frequently used methods in researches will be applied.*	*Project Subject Research*	*Preparation of Powerpoint Presentations*
12.15 – 13.30	LUNCH			
13.30 – 15.00	**Access to Information on the Internet**	**Statistics II**	**Project Proposal Writing I Advisors in Biology, Physics, Chemistry and Mathematics**	**Submitting Project Proposals Advisors in Biology, Physics, Chemistry and Mathematics**
Course hour: 2 (Block)	*Literature search in scientific research, practical ways and the use of ULAKBIM will be presented in scientific research.*	*Basic concepts in statistics and methods used in biological research will be explained.*	*Project proposal writing activities will be done.*	*Presenting the project proposals*

15.15 – 16.45	**Ethics of Scientific Research**	**Reporting Research Results**	**Project Proposal Writing II Advisors in Biology, Physics, Chemistry and Mathematics**	**POSTTEST Test Time: 50 minutes 15: 15-16: 10**
Course hour: 2 (Block)	*Ethical violations of ethical rules will be discussed in scientific studies.*	*The reporting process of the findings obtained from scientific research will be explained.*	*Project proposal writing activities will be done.*	**CLOSING**
Total: 30 Course hours	**8 Courses**	**8 Courses**	**7 Courses**	**Courses**